# MTM

## THE JOURNAL OF METHODS-TIME MEASUREMENT

July-Aug

1955

Vol. II

No. 3

*In This Issue . . . . .*



MTM ASSOCIATION FOR STANDARDS AND RESEARCH

The Journal of Methods-Time Measurement is dedicated to the technical aspects, application developments and general news items concerning the advancement of MTM.

The Journal encompasses the fields of endeavor that were formerly publicized in the MTM Newsletter and MTM Bulletin.

The technical section of the Journal is concerned chiefly with recent research developments both from the established research program at the University of Michigan, Ann Arbor, Michigan, and from somewhat smaller allied projects being conducted throughout the Association membership.

New applications of MTM as well as refinements of established applications are presented in the Application Section to illustrate specific approaches to management problems that can be solved through the use of Methods-Time Measurement.

Current events in the lives of persons associated with MTM are described in the general news section.

The Editorial Staff welcomes contributions for all three sections described.

LITHOPRINTED IN THE UNITED STATES OF AMERICA BY
CUSHING-MALLOY, INC., ANN ARBOR, MICHIGAN, 1955

# MTM

THE JOURNAL OF METHODS-TIME MEASUREMENT

MTM ASSOCIATION FOR STANDARDS AND RESEARCH

Printed by
Cushing-Malloy, Inc.
Editor . . . . . . . . . . . . . . . . . . . . Richard F. Stoll
Assistant to the Editor . . . . . . Mary J. Hendricks



## CONTENTS



* *** *

The Journal is published five times annually during the months of February, April, June, August, and December.

Subscriptions Available Through
MTM Association, 531 E. Liberty Street
Ann Arbor, Michigan

Subscription: $2.50 per year in U.S. and Possessions and Canada. Single copy, 60 cents. Elsewhere $3.50 per year. Single copy, 75 cents.

Volume rate for 25 or more copies of any one issue - $ .50 per copy.

Application for 2nd class postal permit applied for at Ann Arbor, Michigan.

# FEATURE

### 4TH ANNUAL INTERNATIONAL MTM CONFERENCE

October 6 and 7, Chicago, Illinois

Charles F. Hautau to Keynote 1955 Conference

*Charles F. Hautau*

Mr. Charles F. Hautau, Head of Hautau Engineering Company, Detroit, Michigan will deliver the keynote address to the Fourth Annual International MTM Conference.

Mr. Hautau, a University of Detroit graduate and a registered professional engineer, heads the company he organized to build automation equipment and complete manufacturing lines. Numerous patents relating to machine tools and mechanisms bear his name.

Mr. Hautau, speaking on "Automation" will give answers to the many questions about automation that arise in industrial management circles. A few subtopics to be discussed are: What is Automation? How extensively does it exist? Under what conditions is it economically feasible? Who can use it? What are its limitations? How does it affect the future of present plant equipment, future design, methods, present employees, future employment, and qualification of personnel? How much must management change its thinking and approach?

It is a privilege and an honor to have Mr. Hautau address the Conference on a subject of increasing importance to the industrial planner.

*Hugh F. McKenna to address*
*Conference Luncheon meeting October Sixth*

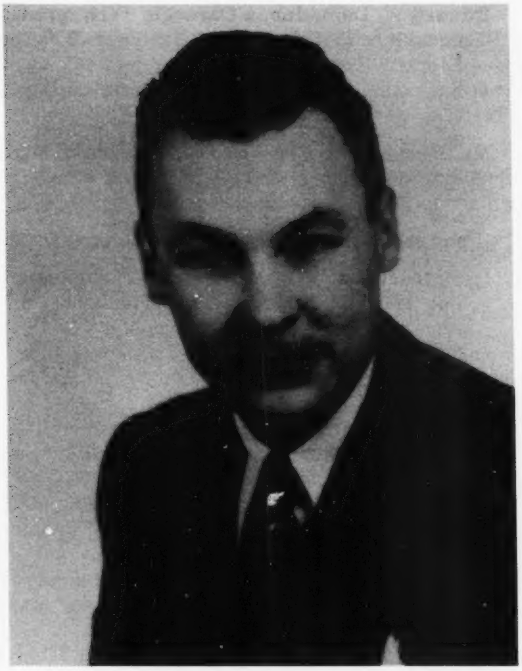
Hugh F. McKenna, President, United States Junior Chamber of Commerce, has chosen as his subject, "Internal Management Relations."

Mr. McKenna, educated at the University of Nebraska, is on a year's leave of absence from an administrative position with Mutual of Omaha. In addition Mr. McKenna has been a representative to the State Legislature from Mutual since 1949.

Mr. McKenna's extensive experience in Junior Chamber activities preceding his election as President qualify him to speak on the important subject of management relations. He is especially interested in "Leadership Training" for young men in industry as well as other programs which will benefit industry through management relations.

*John A. Willard to address*
*Conference Luncheon meeting October Seventh*

John A. Willard, President of the MTM Association, will speak on the subject "Super-Vision for Industrial Management." Mr. Willard will show how MTM and the MTM Association affect management handling of industrial problems. His wealth of experience in the Industrial Management field provides him with an exceptional background to address the conference on this topic.



*Elmer N. Barry*

Elmer N. Barry, Industrial Engineering Supervisor, West Bend Aluminum Company, will discuss the subject "Developing Standard Data for Inspection Standards with MTM."

A Wisconsin graduate, Mr. Barry was previously a foundry metallurgist, and a time study and methods engineer.

His talk will consist of a discussion of the problems normally present in the setting of inspection standards; and the material presented will center around an actual set of standard data developed for the gaging of parts. The development of the data will be covered in a step by step fashion with copies of the material presented to those in attendance. Methods of expanding the data, and limitations and advantages of building standard data with MTM will also be discussed.

Charles A. Bogenrief, Department Head of Industrial and Plant Engineering, Grayson Controls Division, Robertshaw-Fulton Controls Company, will explain "MTM's Part in Establishing Assembly Methods for Incentive Purposes."

Mr. Bogenrief, a Registered Professional Engineer, is a Past President and Director of the Los Angeles Chapter of S.A.M., and a Past President of the MTM Association of Southern California.

Grayson Controls Division manufactures thermostats and components for gas fired water heaters and space heaters. Prior to the use of MTM they were hard pressed with several problems:

1. Inability to accurately describe work methods necessary with incentives.

2. Difficulty in pre-planning assembly operations to assure line balance for flow purposes.

3. Estimates for cost purposes on proposed new products were quite often 10 to 15% or more over or under actual standards when the unit was in production.

Mr. Bogenrief will present their solution to these problems and the advantages gained through using MTM to establish sound standards.

*Charles A. Bogenrief*

*Edward W. Demmler*

Edward W. Demmler, a Carnegie Tech. graduate, is Headquarters Staff Industrial Engineer, Westinghouse Electric Corporation. His subject will be "Cost Elements of Manufacturing in Relationship to MTM."

Mr. Demmler has served as a production manager, and a management consultant among others before accepting his present position.

His presentation will cover the following points:

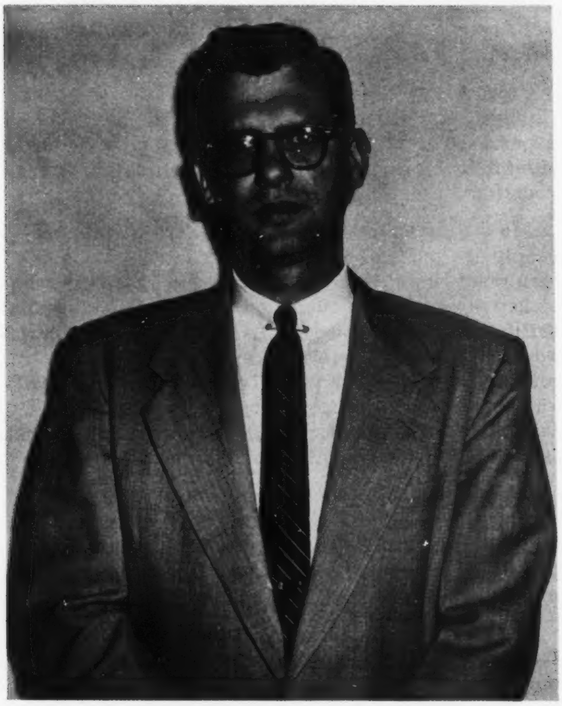
1. Product design cost elements—examples of how MTM analysis of part and assembly design reduces manufacturing costs.
2. Tool design cost elements—designing and constructing manufacturing aids for maximum economy.
3. Machine and part handling cost elements—modifying machinery to provide *both* mechanical adequacy and motion economy.
4. Workplace layout cost elements—using MTM as a guide to the workplace that will provide low costs and operator satisfaction.
5. Balancing time cost elements—achieving balance on progressive or paced lines for maximum productivity.
6. Operator training cost elements—the MTM method of reaching standard production in minimum time.
7. "Creeping Change" cost elements—methods control with MTM.

Ralph W. Eastwood II, Industrial Engineer and Supervisor of Standards Development, The Glenn L. Martin Company, will speak on "MTM in Aircraft Assembly."

Mr. Eastwood, a graduate of Syracuse University, is engaged in the functions of Methods, Standards, Cost and Performance Controls.

He will explain how The Glenn L. Martin Company Cost Control and Reduction Programs have demanded an economical, consistent, and equitable system of Standard Data Development and Application. The attainment of such a system, through the proper MTM application approach, has fostered improvements in the functions of Planning, Estimating, Scheduling, Tooling, Manufacturing and Cost Control; and has provided methods and performance improvements with resultant cost reductions.

*Ralph W. Eastwood II*



*William A. Gierl*

William A. Gierl, Industrial Engineer, Steel City Electric Company, will show the development of "An Incentive Plan For the Tool and Die Room."

Mr. Gierl, a Carnegie Tech. graduate lists some years as a management consultant in addition to his past experience in industry.

He has the following to say about his subject:

"The management of Steel City Electric Company was faced with a problem common to many organizations. Highly skilled workers—in this case Die Makers, Die Service Men, and Machine Operators—were disgruntled because their earnings were only slightly more, and in some cases less, than unskilled operators working on incentive in the Press Room. In addition, there was a large backlog of new and replacement dies to be made, and die repair was slow and uncertain. There were, of course, several courses of action open to the company. The best solution to the problem, however, seemed to be an incentive plan for the Tool and Die Room—if it were possible to devise one.

"With the use of MTM to cover the manual portion of the operations performed, time study and empirical data for the machine operations, and Work Sampling to determine allowances, a workable group incentive plan was developed.

"The results to date have been gratifying. The Tool and Die Room workers have increased their take-home pay. The backlog of dies to be built has practically disappeared and the total work force has been reduced."

Robert J. Levin, Production Engineer, United Mills Corporation, will discuss his company's changeover to MTM.

Summarizing his talk, Mr. Levin states:

"The problem of make up pay has always been a bugaboo in the needle trades industry what with its usual high turnover rate and lengthy training for new operators. Add to this the frightening reality of hundreds of high fashion styles changing two and three times yearly and you have a nightmare. Top this off with small job lot cuts going through the factory and the payroll could easily rival the national debt for red ink.

"How this seemingly chaotic pay plan situation was defeated and turned into an incentive plan which protects the earnings of employees while guaranteeing high output for a minimum of supplementary pay will be explained.

"Clear cut examples of its application through MTM will be given . . . with additional information as to how the plan was broadened to cover indirect labor in the changeover section of our factories.

"This talk promises to reveal a most interesting and novel use to which MTM can be applied in any factory making any product."

*Robert J. Levin*

Howard Lickerman, Production Manager—Partner, Society Lingerie Company, will present the problems involved when Society Lingerie decided to use MTM instead of Time Study; and why MTM was better than Time Study to solve those problems.

Mr. Lickerman, who attended both Purdue University and Northwestern, has been with Society Lingerie for nine years and now heads Production.

He states that there were three reasons why a change to MTM was necessary:

1. Their rate structure was experiencing *Creeping Change.*
2. There was a need for more accurate rates on short run operations.
3. There was a need to save time setting rates.

Mr. Lickerman will sketch his firm's history of some 45 years and show that they have devolved from the process of Rate Arbitration to the present system where almost every operation in the plant is on an MTM piece work rate. He will give concrete examples of how they set rates on their Thread Trimming equipment. He will discuss the system that they use for setting rates on Sewing as well as some of the more unusual bonus system features they have built into their MTM rates for the Supervision.

O. M. Aders, Manager, Personnel Development, Perfect Circle Corporation, will present the Personnel Analyst's approach to "Choosing the MTM Engineer."

Mr. Aders, a graduate of Indiana State Teachers' College and Purdue University, has had extensive experience as an industrial psychologist, personnel administrator, manager, industrial educator, and vocational coordinator.

In summarizing his talk Mr. Aders states that people are more valuable than machines and therefore must be selected more carefully. Men must be picked scientifically, educated adequately and handled skillfully for effective results in MTM or any similar work. We can no longer pick people by hunches, guesses, size, or features. The so-called "wizzard" who says he picks people by single traits actually depends more on subconscious reaction and personal prejudices than upon any other thing.

Temperament is the cause of more failures than all other things combined. Certain temperament profiles suggest the cause of failure and thus give a clue to proper measures for handling the person to prevent the expected failure.

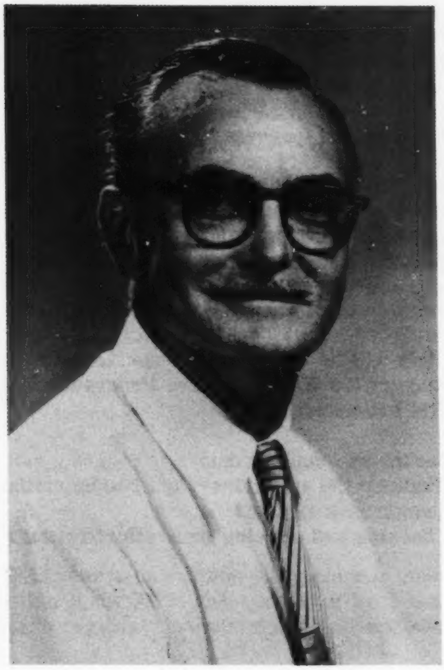
Mr. Aders will present temperaments most likely to be handicapping; concluding that when the temperament of the person suits the work situation, the chances for success are much greater than under any other condition.

Charles Robison, Methods and Standards Branch Head, Management Engineering Division, Bureau of Supplies and Accounts, Navy Department, will speak on "MTM Applied to Paper Work and Punched Card Operations."

Mr. Robison, a graduate of Erskine College, has also had specialized training at George Washington University. He has spent the last eight years of his Navy employment in the Management Engineering Field. During the past eighteen months he has supervised the experimental application of engineered time standards to Supply Depot Operations.

In his talk, Mr. Robison will: describe the types of paperwork and punched card operations covered by standards; explain why MTM was selected as the predominant technique for measurement; give specific examples of how MTM was used in setting standards; touch lightly on the control systems employed; and report on the results achieved through the use of standards.

*Charles Robison*



*Lee G. Smith*

Lee G. Smith, Senior Industrial Engineer, Baldwin Piano Company, will show the real value MTM has proven at Baldwin Piano. His subject will be "MTM as Applied to the Manufacturing Process of a Pulse Transformer."

Mr. Smith, a graduate of Northwestern University and the University of Wisconsin, has spent twenty-five years in the Industrial Engineering Field, covering the entire field of management.

His presentation will cover the step by step program of initial analysis, product design revision, methods revision, tool and fixture design, installation of plan, operator training, and finally the resulting savings of 24,000 hours per year.

William A. Young, Works Manager and Chief Engineer, Steel City Electric Company, will address the conference on the background of "An Incentive Plan for the Tool and Die Room."

Mr. Young, a Pittsburgh graduate, has spent eighteen years with Steel City Electric, and is well qualified to discuss the information pertaining to the adoption of their present Incentive Program, and the administration problems met and overcome in selling, installing and operating the plan.

*William A. Young*

*W. P. Juckem*

W. P. Juckem, Plant Manager, Eagle Signal Corporation, will speak on "How MTM Aided a Specialty Manufacturer to Install a Standard Hours Wage Incentive Program."

Mr. Juckem, a Sheboygan Business School graduate, has had advance work at Iowa and Illinois Universities. Some fifteen years of industrial engineering experience preceded his assignment to install a wage incentive program at Eagle Signal. In addition Mr. Juckem has been responsible for Labor Relations, and has succeeded in negotiating wage incentives into the union contract at Eagle Signal.

His talk will be based on his experience as administrator of the Wage Incentive Program which used MTM extensively in:

1. Setting up standard data
2. Training the supervisory staff to be methods conscious
3. Checking and policing their effort rating

C. W. Bozman, Manager of Industrial Engineering, Otis Elevator Company, will discuss "Practical Application of MTM for Job Shop Assembly Operations."

Mr. Bozman, schooled at Bridgeport Engineering Institute and the University of Maryland, received his industrial engineering experience with DuPont and Dan River Mills before going to Otis Elevator.

In summing up his talk, Mr. Bozman states:

"It is assumed by some management that MTM is too cumbersome and costly a tool for practical application for Job Shop Assembly Operations. An explanation of how this has been accomplished by industrial engineers in one large job shop company will be discussed, along with approach, procedures and examples.

*C. W. Bozman*

Resumes are not available at this time for the rest of the speakers for the 1955 Conference. These important speakers are as follows:

Wayne M. Biklen, Director of Quality Control, American Safety Razor Corporation—"Statistical Quality Control and MTM"

Richard L. Burdick, Assistant Manager of Industrial Engineering, The Maytag Company—Concurrent Application Seminar: Machining Panel

David L. Raphael, Research Associate, University of Michigan—"Research—An MTM Application"

David J. Tracy, Director of Engineering, International Furniture Company—"MTM and Production Design"

Irl Ward, Vice President, International Furniture Company—"MTM and Production Design"

## INTRODUCTORY PROGRAM October 5, 1955

This year's Introductory Program is under the direction of the MTM Association of Southern California, a regional Chapter of the National Association.

Attendance at the Introductory Program has increased each year until now the program has become an integral part of the Annual International Conference.

The program is designed to acquaint attendees with the fundamentals of MTM and typical applications to industrial operations. Six major topics will be discussed:

1. *Introductory Remarks*—Introductory remarks will be given by Mr. James Stahlman, Chief Industrial Engineer, Preco, Inc. He will present a brief summary of predetermined data systems, with particular emphasis on the technical definition and development of MTM. In addition there will be an interest provoking demonstration, without analysis.

2. *Introduction to the Data*—Mr. Stahlman and Mr. Donald Wheeler, Standards Supervisor, Grayson Controls Division, Robertshaw-Fulton Controls Company, will next discuss the twelve (12) basic MTM motions. For demonstration purposes each member of the group will be provided with a "gimmick" which will help them to feel and understand the most common motions involved.

The demonstration given during the introductory remarks by Mr. Stahlman will next be quickly analyzed.

3. *Application of MTM*—V. A. Metzger, Assistant Professor of Commerce, Longbeach State College, will show a film relative to the application of MTM. Another group visualization problem will be demonstrated following this film.

4. *Uses of MTM*—Robert Goodwin, Chief Industrial Engineer, Adel Precision Products Division, General Metals Corporation, will discuss the many uses of MTM in regard to both methods and standards as well as its relationship to tooling, pre-production planning, training, etc.

The relative usefulness of MTM in various types of industries will be discussed next by means of specific industrial applications.

5. *Summary and Review*—Mr. Lloyd Gilbert, Chief Industrial Engineer, Virtue Brothers Manufacturing Company, will quickly review the basic motions with emphasis on the most common combinations and on the chart of simultaneous motions.

In addition a film on "Setting MTM Standards" will be shown.

6. *Group Sessions*—Concluding the program will be five panel presentations using appropriate visual aids and followed by a group discussion. The topics of these panels and the Chairmen of each session will be as follows:

1. Methods Engineering with MTM in advance of Production—Mr. Robert Goodwin
2. Pack and ship (furniture) by MTM—Mr. Gilbert
3. MTM on the Farm—Mr. Metzger
4. MTM in the Machine Shop—Mr. Stahlman
5. MTM in the Foundry—Mr. Wheeler

# APPLICATION

# I

## MTM USAGE—PROCEDURES AND EXAMPLES

by

Mr. Claude J. Townsley
Farnsworth Electronics Company
Ft. Wayne, Indiana

### ESTIMATING

The MTM procedure lends itself so readily to estimating that one will frequently use it without being conscious that this is what he is doing. There is a distinction between estimating with MTM and "guesstimating" without the aid of any guiding data. In the absence of data, the entire estimate must be a guess. The more data that is available, the more factual will the estimate become. When MTM data is used, the only real estimating comes in the determination of the motions which will probably be used to do the work. If these are visualized correctly, then there will be small difference between the estimated time and the time which would be established in the shop by direct observation. The saving in engineering time which results strongly promotes the use of estimating standards, once they have been established. Because of this, engineers use MTM estimating procedures confidently, without allowing the "factors of safety" which are usually applied to "guesstimates" for safety's sake.

### DEVELOPING EFFECTIVE METHODS IN ADVANCE OF PRODUCTION

Before one puts an operation into production, he should find the best method that he can use for that particular operation. Using the MTM data, one can actually go through the operation and analyze the different methods used to show which method is most efficient. By doing this type of thing in the laboratory or at the desk, one can get the best of several methods in advance of beginning production.

The effect of advanced-methods engineering with MTM is to reduce the number and frequency of changes and improvements, because the corrective and simplification work is done before the job exists. We thereby reduce one of the human-factor problems —that of giving the employee a feeling of greater security on his job.

### IMPROVING EXISTING MOTIONS

A practical man recognizes that, regardless of the amount of methods engineering work which is done in advance, there will always be a vast amount of profitable methods improvement work to do on existing jobs. Even work for which effective methods were developed before beginning production can usually be further improved as more experience is gained with the method.

The Methods-Time Measurement procedure ranks second to none in effectiveness as a means of methods improvement. The reason is obvious. When a method is examined motion by motion and the exact time required to perform each motion is known, it would be difficult to find an operation not permitting some improvement.

### GUIDING PRODUCT DESIGN

Most products can be designed in different ways, each of which will be equally satisfactory from a functioning standpoint. However, of the different designs, usually one will be more economical to manufacture. In many organizations, it is a growing practice to have the methods engineers review new product designs while they are still on the drafting board so that the engineer may make design changes which will reduce manufacturing costs.

Rather than relying upon his past experiences, the methods engineer will obtain greater results by a detailed study using the MTM procedure. The operations required to produce the part are first listed and studied to see if any can be eliminated by design change. Then the motions required to perform each operation are visualized and MTM values assigned. Further refinements in design may result from this detailed analysis of motions. One of the most commonly encountered possibilities for improvement is the redesign of the part to make it symmetrical so that positioning time is reduced as the part is put into work-holding devices.

## DEVELOPING EFFECTIVE TOOL DESIGNS

Using the MTM procedure, the tool designer can gain real assistance in doing his work effectively. Many designs of tools are usually available to him for accomplishing a given objective. He will base his choice on such factors as original cost, tool life, obtainable accuracy, maintenance cost, etc.

If he is as methods minded as he should be, he will also wish to build into the tool economy of motion in its manipulation. To accomplish this he needs only to visualize the motions required to manipulate each type of tool he has under consideration. By assigning the MTM standards to each motion, he can then readily determine which design of the tool requires the least handling time.

When the design that involves the least handling time is the most costly, a consideration of the repetitiveness of the job will determine whether or not the tool is economically justified.

Many companies, recognizing these obvious advantages, have trained their tool designers in MTM.

## SELECTING EFFECTIVE EQUIPMENT

In cases where several different designs of machine tool equipment can be purchased to do a given job, the MTM data is of assistance in arriving at the proper choice. All that is necessary is to visualize the motions required for manipulation in each case and to apply time standards to determine which sequence is best.

## SETTLING GRIEVANCES

Methods-Time Measurement has proved to be extremely valuable in settling grievances regarding the correctness of time standards. When the MTM procedure is used, it does not take long for all concerned to recognize the inseparable nature of method and time. A few demonstrations of the accuracy of the MTM data are sufficient to convince workers and supervisors alike that *if the proper method is followed*, the standard can be met, but that if extra motions are introduced, the standard will appear "tight."

## TRAINING SUPERVISORS TO BECOME METHODS CONSCIOUS

Training in the MTM procedure is one of the best available means of developing a true appreciation of the importance of correct working methods. It is difficult for the untrained individual to place much importance on the presence or absence of a few minor motions in a given motion sequence. After he has learned to observe, record, and assign time values to motions, however, and has seen how each motion adds to the total time required to do the job, he cannot fail to realize how necessary it is to reduce motions to a minimum to develop the best method.

Ineffective motion sequences become familiar to the trained observer so that he sees them almost automatically and begins to plan for their elimination. For example, it is common to see an operator pick up a small part with the left hand, transfer it to the right hand and then move it to its destination. This involves a transfer grasp and other motions which can be eliminated if the work-place can be rearranged so that the right hand can pick up the part.

## RESEARCH

Methods-Time Measurement provides a tool of research that makes it possible to extend existing knowledge about methods and time considerably. We can now find answers to such questions as, "Why is one operator able to produce twice as much as another?" etc. Many investigations of other problems remain to be made. One such problem might be a study of the way methods vary as an operator learns to do a new operation. There are many other equally fascinating investigations remaining for the research-minded individual. It is hoped that many studies of this kind will be made by industry and universities and that the findings will be published.

## ESTABLISHING TIME STANDARDS

When the times required to make every motion used to perform an operation are totaled, and the proper allowances are added, the result is a standard which may be used for wage payment purposes or for any of the other uses to which time standards are put. Thus the MTM procedure makes possible the establishment of accurate time standards on manual operations with minimum use of stopwatch studies.

The MTM data consists of predetermined standards for all types and classes of motions commonly used in industry. It, therefore, permits the establishing of the time required to do a job as soon as the method for doing it has been determined. *The method must be established exactly and in detail before the allowed time can be determined.* This forces careful analytical work with the emphasis on method.

Time study all too frequently is undertaken with insufficient attention paid to methods. This results in standards which, although set correctly on existing methods, soon become out of line due to the

ingenuity of the operators. Serious industrial relations problems are therefore created.

Allow me to caution you that using MTM for establishing time standards is inadvisable unless you have received detailed MTM training. The simplified data and brief instruction you have received today does not qualify you to set job rates by MTM. However, I have indicated this usage to suggest MTM possibilities. Perhaps you would consider getting the required training for this purpose.

## DEVELOPING TIME FORMULAS OR STANDARD DATA

Time study men have long recognized that it is uneconomical to establish large numbers of standards by individual time studies and that serious inconsistencies are likely to result. They have, therefore, made use of standard data, which permit the establishing of consistent time standards in a fraction of the time it would take to make a time study.

Standard data are conventionally developed from time study data. Standard elements are established and then the time for performing these elements is determined by studying a representative sampling of the class of work to be covered.

The Methods-Time Measurement procedure may be substituted for time study to good advantage. When the standard elements comprising the work have been established, the method of performing each element may be expressed in terms of the motions used. The time required is then determined from the methods data. This usage also requires detailed training.

## METHODS TIME MEASUREMENT APPLICATION PROCEDURES

1. Choice of Operator.

The analysis required by the MTM procedure is so detailed that methods improvements are often brought to light. The methods engineer will want to try these ideas while they are still fresh in his mind. He, therefore, will want to choose an operator for study who is cooperative and who will be willing to try out improved methods without undue reluctance. An operator who is interested enough to offer ideas himself is particularly desirable.

2. Approach to Operator

At the beginning of a study the methods engineer should let the operator know that he wishes to study and record the motions the operator is using on his job. This will often lead to a friendly discussion of the motions and the reasons for making them. The methods engineer should discuss any of the operator's questions, freely and explain as much of the MTM procedure as the operator is interested in knowing. The methods engineer will promote good relations if he will show respect for the operator's superior knowledge of the details of his job and if he will commend skillful motion sequences the operator may use.

3. Sketch of Work Place.

The sketch should identify the location of tools, materials, equipment, and fixtures. Any dimensions that may be helpful in judging the length of motions or the exact location of tools, etc. should always be included in an MTM sketch.

4. Identification of Parts.

The parts being worked upon should be listed and sketched on the observation sheet. The MTM procedure requires a thorough knowledge of the nature of the part before observations begin; for as the engineer begins to list and classify the motions used, he must know the size of the part, the symmetry of the part. This intimate knowledge of the part enables the methods engineer to better judge the methods he observes.

5. Preliminary Motion Study.

The methods engineer should assure himself that the method being used is sufficiently good to make its recording worthwhile. He should watch the operation for a short time, during which he reviews motion economy principles in his mind. He should particularly watch for idle periods or for one hand being used as a holding fixture.

6. Division into Elements.

When dividing the operation into elements, constants and variables should be recorded separately. Elements should be kept as short as possible to enable the observer to identify clearly and quickly the motions used to perform them. To gain speed and accuracy, the observer must be able to mentally reconstruct each element after watching it once or twice.

The elemental description should be written clearly and in such a manner that an engineer unfamiliar with the described method, but with an understanding of MTM, can accurately reconstruct the method followed by reading the element description and motion sequence.

7. Method Analysis of Elements.

After dividing the operation into elements, the next step is to determine the method employed in performing each element. The observer will watch the first element until he can mentally reconstruct it and then will record the classification of motions on his observation sheet. He repeats this process until the motions used to perform all elements are recorded on the observation sheet.

Foreign elements are those unnecessary to the job, even though they may be unavoidable. Breaking a tool or personal requirements would be classed as foreign elements, which are usually covered by allowances derived from all-day time studies. Therefore, when foreign elements are observed during an observation, they need not be analyzed or recorded.

Elements which are necessary but not repeated every cycle should be analyzed and recorded in the same manner as the repetitive elements. A notation should be made on the observation sheet of the number of times they occur per cycle.

8. Methods-Time Standards Application.

After the observations have been completed, the proper time standard for each motion is recorded on the observation sheet. This is done by referring to the MTM card. Speed may be gained, at a slight sacrifice of accuracy, by using the simplified methods-time data to record the time standard. The simplified method-time data include a fifteen per cent allowance for personal time, fatigue, and unavoidable delays.

9. Elemental Time Determination.

Elemental time is determined by adding together the times assigned to the motions used to perform the element.

10. Allowances.

The basic methods-time standards represent the time required for a normal operator with average effort and skill to make the motions. A true time standard includes an allowance to compensate for lost time during the day due to fatigue, personal time, and unavoidable delays.

11. Allowed Time.

The time allowed for each element multiplied by the number of times the element occurs per cycle equals the allowed time for that element. Adding all the allowed elemental times together represents the time which an operator of average skill, giving an average effort under average working conditions would require to perform the operation when using the method upon which the allowed time is based.

12. Checking.

Since opportunities for errors exist, the allowed time should be carefully checked to catch any serious errors that might have been made.

13. Records and Filing.

All observation sheets should be filed for they provide a record of the allowed time and also a complete record of the method upon which the allowed time is based. If a question arises in the future about the accuracy of the time value of an operation, it will be merely necessary to reapply the MTM procedure. If the method is the same, the motion pattern will not be changed. If the method has changed, the exact nature of the change is easily ascertained.

## EXPLANATION OF PROJECTION WELD STUDY

Now let us go through a projection weld study. This is an actual study taken on the floor. The original study used the more detailed basic MTM values. However, to illustrate the procedure, we will show the motions in the simplified data.

1. Choice of Operator.

The operator chosen was one of more than average skill who was very cooperative. This particular operator had, in the past, turned in several very good method improvements which had been adopted and were in use in the welding department.

2. Approach to Operator.

This operator had taken an MTM appreciation course. Since he understood what the study was about, our approach to him meant merely telling him we were going to study his operation.

3. Sketch of Workplace.

Next we drew a sketch of the workplace layout. Looking over the layout, we found that it was a fairly efficient one. We measured all the tote pans, tables, and other equipment and drew them in the sketch in

relationship to the projection-weld machine. Next we measured all dimensions and placed them in the sketch.

4. Identify Part.

We then identified the parts, the machine used, material used, etc., in detail. We also made notes of all such special safety conditions as safety goggles worn by the operator and use of a hand-trip button. Since all stock-up was done by the material handler, this was noted on the observation sheet as should be any other identifying statement.

5. Preliminary Motion Study.

During drawing of the sketch, we decided that the workplace layout was efficient enough to warrant a study. To continue, we looked over the motions being used. We noticed a drop delivery used in the "dispose" element, and that neither hand was idle for long periods during the operation. We then started the division of elements.

6. Division of Elements.

During our preliminary motion study, we noted that the "get part" element, which is usually the first element, was being "limited out" by machine time. We therefore decided to make the first element the one that would normally precede the "get part" in the operation cycle. This element was "depress button to activate welder." By using "depress button" for the first element, the second element was "machine time, get one bracket and one weld nut." Then "move over bracket and one weld nut to weld tips" was the third element. The fourth element was "disengage assembly from weld tips and dispose of assembly." The next element read, "position one weld nut on weld tips" and, logically, the last element of this operation was "position one bracket on nut on weld tips."

These elements may seem unduly short, but this helps the beginning observer to make a mental picture of the element before he records it on the observation sheet. Even for an experienced MTM applicator, elements should not usually contain more than twenty motions.

7. Methods Analysis of Elements.

Now that we had drawn a sketch of the workplace, recorded all identifying information of the operation, and had broken the operation into elements, we began analyzing each individual element. The observer should assume a position from which all motions required for the operation can be observed. This position should also, if possible, be similar to that of the person being studied—i.e., if the worker is sitting, the observer should sit too—and should allow the observer to cause minimum distraction.

By watching a few cycles, we obtained a fairly complete mental picture of the motions required to perform the entire projection-weld operation.

We then studied each element separately and recorded the motions on the observation sheet. Motions that were performed by the right hand were recorded in the column headed "right hand," etc. Body motions were also recorded in the "right hand" column.

In the "depress button" element, we observed a reach, a grasp, and a depress. By measuring with a flexible ruler, we determined the reach to be ten inches. We recorded "R10" on the observation sheet. The grasp was a touch or contact grasp which has no time value; however, we recorded a "G" for it. To depress the button there was a hesitation which we analyzed as an "apply pressure" so we recorded "AP." All of these motions were done by the right hand so they were recorded in the "right hand" column.

"Machine time, get one bracket and one weld nut" was the next element. We saw that during the machine cycle several motions were "limited out." The right hand released the button, reached twelve inches to the tote pan of weld nuts, and grasped one nut. Meanwhile, the left hand reached eighteen inches to a tote pan of brackets. Now since the required type of grasp cannot be done at the same time as the one by the right hand, we lowered it one line from the right hand entry on the observation sheet.

The next element was "move one weld nut and one bracket to the weld tips." The left hand moved twelve inches and the right hand moved sixteen inches to the weld tips. Both hands regrasped the parts twice during the time they were moving toward the tips. The right hand also turned during the move. Since these regrasps and turns were done during the move, a line was drawn through them indicating that no time was allowed for them. The moves, therefore, became the "limiting motions." Since the right hand moved sixteen inches, or farther than the left hand moved, it became the "limiting motion." We encircled the "M12" to indicate that no time was allowed for this motion because it was "limited out" by the "M16."

The element "disengage assembly from weld tips and dispose of assembly" was performed entirely by the right hand. The operator reached two inches to the bracket assembly on weld tips, grasped the bracket, disengaged it from weld tips, moved it two inches away from the tips, and released the bracket into the tote pan under the weld tips.

Next the operator "positions one nut on the weld tips" with the right hand. He moved the weld nut two inches toward the weld tips, regrasped the weld nut, moved the weld nut two inches onto the weld tips, positioned the nut on the weld tips, and released the nut.

The operator then performed the last element of the operation to "position one bracket on weld nut on weld tips." The left hand, which had been holding the bracket for the last two elements, moved the bracket six inches to the weld tips. During the move a regrasp was "limited out," so a diagonal line was drawn through it on the observation sheet. While this move had been taking place, the right hand had moved away from the weld tips. Since the purpose of moving the hand was to get it out of the way, this was called a reach, and was "limited out." We, consequently, encircled the "R6" to show it was "limited out."

8. Methods-Time Standards Application.

Now we had completed the observation of the operation. There were no foreign elements. We then assigned the proper time values to the motions we had on the observation sheet by referring to the simplified data table and applying those times to the observation sheet.

9. Elemental Time Determination.

By adding all the times in one element from the observation sheet, we arrived at the elemental time.

10. Allowances.

Since we were using simplified data, no further computations were necessary.

11. Allowed Time.

The time allowed for each element multiplied by the number of times the element occurs per cycle is the "elemental allowed time." Adding all these elemental allowed times of an operation will give us the TMU allowed for an operation. In this operation, the allowed time for element number one was 34 TMU, number two was 48 TMU, etc. The total allowed time for this operation was 160 TMU.

12. Checking.

Since this was a short operation, this observation should be checked very thoroughly. We should check the application of methods-time standards, check over addition and multiplication—in other words, make sure we have not made any error.

LIST OF CLASSES OF WORK TO WHICH MTM HAS BEEN APPLIED SUCCESSFULLY

Metal Working Industry

Machine Tool Operations
Milling Machine
Engine Lathe
Radial Drill Press
Sensitive Drill Press
Vertical Boring Mill
Turret Lathe
Keyseater
Planer
Shaper
Grinder
Layout

Bench Operations

Buffing
Filing
Scraping
Fitting
Hand Tapping
Assembly

Textiles

Copping
Rewinding
Coning
Weaving
Drawing in

Sheet Metal

Punch Press
Shear
Brake
Spot Welding
Arc Welding
Projection Welding
Seam Welding
Heli-Arc Welding
Soldering, soft
Soldering, silver

Dry Cleaning

Marking
Cleaning
Pressing

Electrical Industry

Stator Winding
Coil Winding
Resistor Manufacture
All types of Assembly

Needle Trades

Power Sewing Machine
Pressing
Cutting—Hand
Cutting—Machine
Boxing
Bundling

Bindery Operations

Gathering
Folding
Stapling
Wrapping
Counting
Inserting

Plating and Finishing

Degreasing
Spray Painting

Steel Industry

Ladle Lining
Machine Operations

Chemical

Processing
Equipment Attendance
Maintenance
Machine Shop Operations

Furniture

Wood working
Upholstering
Sewing
Painting

**Foundry**

Core Making
Molding
Cleaning
Shake Out

**Office Work**

Filing
Typing
Telephone Handling
Dictaphone Cylinder Shaving

**General and Miscellaneous**

Plastic Molding
Die Casting
Wire Forming
Assembly
Large
Medium
Small
Very Small
Tire Building
Ceramic Operations
Clerical and Communications
Inspection
Pipe Fitting
Receiving
Shipping
Storekeeping
Material Handling
Progressive Assemblies
Tool Making
Maintenance
Printing
Shoemaking

# APPLICATION

# II

## THE USE OF PREDETERMINED TIMES IN LABOR NEGOTIATIONS

By
OWEN FAIRWEATHER
Partner, Seyfarth, Shaw & Fairweather
Chicago, Illinois

THE ASSIGNED title for my talk is the "Use of Predetermined Times in Labor Negotiations." The word "negotiation" conjures up ideas like compromise and concession. Incentive standards should never be negotiated in that sense and neither should predetermined times. Hence, the short answer to the question presented is "predetermined times should never get mixed up in labor negotiations."

However, this is far too short an answer. Obviously, the real question presented in the title should be stated more broadly. It involves "The Role of Predetermined Times in the Union-Management Relationship."

I am playing with words but I am doing it intentionally to point up a very basic difference in the approach of unions and managements toward the establishment of incentive standards.

Walter Reuther, the CIO President, made the union approach clear in a release to various Regional Directors of the UAW-CIO on December 8, 1949. He stated concerning MTM predetermined times the following:

> "A new scientific management system, known as methods-time-measurement is receiving wide publicity in management circles and efforts will undoubtedly be made to introduce it in the plant as a new and improved substitute for present time study programs. Its practical effect is virtually to abolish collective bargaining on production standards and piece rates."

Therefore, five years ago, in 1949, Reuther was pointing out that the use of predetermined times might limit a union's ability to collectively bargain production standards and piece prices. Its introduction as a tool in incentive rate establishment should be resisted, Reuther said, because the traditional methods of establishing incentive standards are advantageous to the union as they keep incentive standards within the collective bargaining arena where concessions can be gained.

The official position of the UAW-CIO is no different than it was five years ago. In a recent arbitration hearing in which MTM predetermined times were being considered, Fred Simon, one of the UAW-CIO incentive experts, read Reuther's 1949 letter to the Regional Directors, and asserted that the position stated therein still represents the official position of that union. In addition, Simon said:

> "The union's position is that the problems of incentive standards are problems of collective bargaining, they are not scientific things."

Concerning MTM, he said:

> "I think if we ever did approach the time of devising some method by which universal time standards would be established we, then, too, would approach the time a universal pay would come into the picture. *** I would feel quite confident that the union would demand that a universal time system would become a universal pay system — and maybe in that way we will eliminate the incentive system."

Now the view that incentive standards should be negotiated and the more scientific and accurate techniques which reduce the need for judgment and hence reduce the collective bargaining area should be rejected was also reflected in the comments of

Nat Weinberg, who is a Research Director of the UAW-CIO, at the American Standards Association meeting in January 1953. He said:

> "Unions are not ready to accept MTM under any circumstances. They are not ready to have acceptable results obtained by collective bargaining replaced by a rigid system."

Solomon Barkin, a very articulate union spokesman, Research Director of the Textile Workers Union, CIO, pointed out the contrast between the union and the management approach to incentive standards when he said:

> "Unions and workers seek to *** be in a position to secure additional wage concessions in the negotiation of work standards.
>
> "Management tends to be in a better bargaining position if the standards are predetermined and a fixed wage relationship set for different levels of application.
>
> "Unions, therefore, prefer to retain opportunities for negotiations on the individual job."

There you have it.

Unions desire to negotiate incentive standards. To them this means compromises and concessions which will "loosen" the standard and increase the earnings potential on the particular job.

Managements want to establish incentive standards on a factual basis. They desire to maintain a consistent earnings opportunity for employees on all jobs so that for the same amount of effort the same earnings will be provided. According to management's view, incentive standards should never be negotiated. Management contends time is a fact and you can't compromise a fact.

This difference in approach to the question of the establishment of incentive standards is fundamental. It cannot ever be overlooked.

It is sad that this difference exists. Good incentive systems maintain high productivity. High productivity maintains our national standard of living. A breakdown of our national standard of living would have serious consequences to all of us and "us" includes the many workers in our factories.

I do not mean to imply that labor leaders want our standard of living to go down, but their position permits them to be more responsive when employees claim that the standards are too "tight."

Nor do I mean to imply that incentive wage payment systems are not legally appropriate matters for collective bargaining. Incentive wage payments make up a very important part of "wages." "Wages" is one of the subjects specifically referred to in the National Labor Relations Act as subject matter for collective bargaining. Even though incentive wages and incentive systems are legally the subject matter for collective bargaining, a company may still take the steadfast position that incentive standards represent time and time is a fact not subject to negotiation.

With this background, let us examine the type of commitments made during the course of collective bargaining with respect to the establishment of incentive standards, and then the typical types of disputes which arise over individual incentive standards. And in the course of such examination we will consider the role of predetermined times in union-management relationship.

The agreements concerning incentives reached in collective bargaining can be classified into three types.

### Type 1 — Those that Are the Specification of Methods of Establishing Incentive Standards

Many management negotiators have agreed to incorporate into the labor agreement, as a contractual commitment, the various procedural steps which are followed by the company's industrial engineers when they establish an incentive standard. This type of contract provision results from the belief that if the industrial engineers follow these traditional steps, the resulting standard will be correct and fair.

To attach incentive manuals as exhibits to labor contracts is common. However, when the language of such manuals becomes contractual, it often has a very unexpected result.

Let me cite one example: The following language was taken from an incentive manual and incorporated in a labor agreement:

> "A minimum of a 30-minute study or 20 cycles, whichever is greater, shall be made in any time study."

This provision sounds reasonable. It is good industrial engineering practice to observe a sufficient number of cycles. However, when this provision was incorporated into the labor agreement, it permitted the union stewards to thumb through piles of work sheets seeking "illegal rates." If the stewards found one based on 18 cycles, rather than 20, the rate could be termed "illegal" irrespective of whether it provided an adequate earnings opportunity for the employees or not.

Incidentally, as a footnote to this particular type of provision, I once knew of a situation where a union steward declared an incentive standard "illegal" because it was based upon an insufficient number of cycles. The company cancelled the rate and established a new "legal" one in its place. The new rate was considerably tighter; the steward got "burned," and the controversy got hotter. This situation merely illustrates that provisions which specify the methods that are followed when an incentive standard is established settle nothing but actually multiply the areas of dispute.

Furthermore, the ability of a staff department to discharge its responsibilities properly and efficiently varies directly with its ability to use the best and most modern procedures and to improve those

procedures without interference by untrained outsiders. You cannot place the responsibility for good performance upon a Methods and Rates Department and permit other persons who do not have that responsibility to tie its hands. If the methods and procedures to be used by the expert staff are fixed by others, this fundamental principle is violated.

When the methods of establishing an incentive rate are incorporated into a labor agreement, it sometimes becomes difficult, if not impossible, for a company to adopt more modern techniques. Some companies who have followed this course have found they must still set all incentive standards by the use of a stop watch in the traditional way and cannot develop their own standard data or use MTM predetermined times procedures.

These managements have foreclosed their right to become more efficient. Furthermore, the negotiating of the methods to be employed in establishing an incentive rate usually results in restrictions on accurate rate establishment and then the incentive program goes to pieces.

### Contract Provision Type 2

The second type of provision found in labor agreements is based upon the theory that a "fair" incentive standard should provide at least a certain "earnings opportunity" above the negotiated base rates, or standard hourly rates for employees willing to put forth incentive effort. Such a provision is a "standard of fairness" against which an incentive standard is to be compared if a dispute arises. It reflects the belief that the real thing one should talk about in collective bargaining is "wages" and not the "methods" of developing those wages.

This approach involves simply an agreement with the union that if an incentive standard does not produce for an employee, *willing to work with incentive effort* earnings at least equal to a certain percentage above the base rate, the standard will be considered "unfair."

This type of agreement anchors incentive earnings opportunities back to the negotiated base rate structure.

Such an anchor generally proves to be extremely valuable. If the industrial engineers have a concrete relationship to work with, they are better able to maintain an incentive system which produces consistent earnings opportunities. Without it, all types of earnings expectancies can arise and they will vary from department to department. Even though such earnings relationships are not expressed in writing, they are very real.

Now let us discuss —

The construction of an "earnings opportunity standard of fairness"

Let us assume that a particular management adopts for itself, as a matter of policy, the view that an employee working with full incentive effort will put forth about 25% more effort than the same employee would put forth when working on a day work basis.

This management will then conclude that it is correct to pay such an employee 25% more pay if he puts forth full incentive effort.

In such a company we would then establish a line on a chart 25% above the base rates of the various classifications and the policy objective of the management would be accomplished if the *average* incentive earnings of employees *working with incentive effort,* when plotted on this chart, fell on this line 25% above the base rates.

However, if we made the contractual commitment in the labor agreement that the company would provide 25% more earnings for employees willing to work with incentive effort, the company would soon get into trouble. Such a commitment would have these results:

*First,* the Methods and Rates Department, if it timed jobs on a high task basis and then used only a 25% incentive factor in establishing the standard, would never be sure whether it had properly discharged the contractual commitment or not. Incentive engineers are human beings and since they are, a certain specific earnings opportunity cannot be provided in each and every standard. Authorities in the field of incentive state that "based on past experience, a standard error of plus or minus 5% is about as good as can be expected from most experienced time study observers who are familiar with the work being observed." Hence, if the earnings when plotted on a chart would produce a scatter within plus or minus 5% the rate establishment would be as accurate as could be expected and the average would be O.K.

Now, plus and minus 5% does not mean exactly what it says. Mr. H. Barrett Rogers of Northwestern University explains that if the errors are distributed normally, it means that the time standard would be within plus or minus 5% of the correct evaluation about 68% of the time. In 28% of the standards, the estimated ratings and the resulting time would be within plus or minus 10% of the correct rating. In the remaining 4% of the standards, the rating would be 15% too high or 15% too low. In other words, time standards calculated from individual time studies which involve a leveling of an individual operator to a hypothetical normal may vary over a 30% range even though 68% of such studies would vary only over a 10% range.

Where observers are unfamiliar with the operations being observed and have had little or no rating experience, Mr. Rogers points out that the standard error will exceed plus or minus 10%, which will double the range of error indicated above.

*Secondly,* if the full 25% policy is expressed as a contract commitment in the labor agreement, the employees could commence to hold back their production

on all new incentive standards. Their claim that an increase in the incentive standard was required on the grounds that the 25% earnings expectancy called for by the labor agreement had not been provided, would be hard to defeat.

Due to the uncertainty that would be introduced by the recognized possibility of error, the Methods and Rates Department would soon be under a pressure to use a higher incentive factor; for example, a 30% incentive factor. The use of a higher incentive factor, either informally or formally, to escape from the trap created by the incorporation of the 25% commitment will, of course, have the effect of raising costs above the level contemplated when the 25% policy was adopted.

Therefore, the commitment in the labor agreement should not be the 25% policy, but rather it should establish an earnings level for full incentive effort below which a standard should be considered unfair. This point can be referred to as the minimum of the "band of fairness" surrounding the 25% policy objective.

If the margin of error problem and risk of slowdowns are squarely faced and fully discussed with the union negotiation committee, it is possible to establish the minimum of the "band of fairness" at a point 15% or possibly 18% above the base rates of the classification, but never higher than 20% even though the policy objective was 25%. How far this minimum relationship must be placed *below* your policy objective will depend on your appraisal of your rate setting accuracy.

Where the errors of leveling are removed by the use of predetermined time systems such as MTM, the minimum of the "band of fairness" can be raised closer to the policy objective.

When you finally come to write up the provision for the labor agreement, the expression would be something like this:

> "A normal operator working with incentive effort shall have an opportunity to earn at least 15% (or 18%) over his base rate."

This merely means that if an individual incentive rate does not provide such an earnings opportunity for incentive effort, such rate is contractually "unfair."

Many companies hesitate to incorporate into their agreements a specific percentage "standard of fairness" which can be applied by an arbitrator if there is a dispute. Rather typically in the steel industry contracts you will find a "standard of fairness" expressed not in percentage but in these terms:

"(1) The new incentive application shall provide equitable incentive compensation over and above the standard hourly rate."

"(2) The new incentive application shall be fairly and reasonably designed to encourage production."

Under such language, an arbitrator made this comment:

> "The compensation calculated under the company's proposed rate is designed to encourage production. It will yield 35% incentive pay to the jobs which can and do offer the possibility of full steady performance. It will offer some incentive to those whose jobs regularly involve some delay. *** In the absence of evidence that the plan here under discussion fails to offer the 'spread' of 35% claimed for it by employer witnesses, it must be concluded that it provides equitable incentive compensation above the standard hourly rate."

It can be seen that the arbitrator has defined these general words to mean that a certain percentage earnings will be made available for incentive effort. However, he did not recognize the need for the "margin of safety" we have been discussing. Such a margin can only be obtained by bargaining for it in a forthright and direct manner.

The incentive system which was being considered in the arbitration case was a "man performance" type. During the periods that the man is idle, either waiting for materials or standing by during a long machine cycle, no incentive compensation would be paid (except possibly a partial payment for "machine attention time.")

Some company policies direct that the Methods and Rates Department shall provide an earnings opportunity of 25% during the machine cycle elements of the job, as well as during the manual elements. However, other managements believe that it is not sound to pay full incentive compensation to the employee while he is standing by watching the machine work. Incentive pay, they contend, is the payment for extra effort expended.

As a matter of pure theory, the view of these latter companies would appear to be correct but there are practical pros and cons to this question which should be the subject for another discussion.

## The Third Type of Contract Provision — Agreements Establishing Certain "Standard Data" as Contractual

We should not pass on from a consideration of the contractual understandings between companies and unions without mentioning those agreements in which certain standard data tables, charts, or formulas have reached such a degree of acceptance by both parties that they are recognized in the labor contracts.

Let me illustrate:

In a large foundry in Ohio the standard data procedures for establishing incentive standards for the molders had worked out very successfully. The union steward would independently develop a standard for a new pattern and that standard would be the same as the one subsequently released by the Methods and Rates engineers. Disputes dropped to virtually zero.

A contractual commitment was entered into between the parties which stated that where identified standard data tables, charts, or formulas were in effect, the company would continue to apply them. The only argument which could then arise would be a claim that the standard data had been improperly applied.

Where a company and a union have been using MTM over a period of time and have found it to produce satisfactory results, they should agree to use MTM in establishing standards. A UAW-CIO steward is quoted as having said about MTM:

> "It's a cure-all. It's going to eliminate 90 percent of the grievances we have now over time studies. With stop watches, you run into a lot of time-study men with personal grudges. By low rating a man's ability or setting the standards too high, they can cut a man's take-home pay by as much as 25 to 40 percent.
>
> "MTM doesn't study the man running the machine at all....
>
> "There's no guess-work about it. The unions are going to be more than willing to accept anything like that....
>
> "I'm thinking of teaching all my twenty-three stewards how to work MTM so when an MTM man comes in to make a study, the steward can go along and check to be sure he's doing it right...."

If agreement to use established standard data and/or predetermined times such as MTM can be reached, a long step in advance would be made. The stop-watch and all the resulting contention and struggling over leveling causes most of our difficulties.

If this type of agreement can be reached adopting MTM it should be reached when such an agreement will reduce the area of misunderstanding. Such agreements grow out of familarity and understanding and hence must start at the local level. Unfortunately, Walter Reuther said:

> "In view of the danger and problems which Methods-Time-Measurement presents, our International Representatives and Local Unions should be instructed and advised vigorously to resist its introduction into our plants. In particular, local unions should guard against becoming in any way involved in the introduction or operation of the system. Under no circumstances should local unions be bound by or to accept findings based on the system."

## The Arbitration Step

Up to this point we have been discussing the type of commitments which should, and should not, be made between a company and a union concerning incentive standards during the course of collective bargaining. Now we should consider the types of disputes which arise and how MTM predetermined time values can be used in resolving them.

Incentive disputes are generally of two types. The *first* involves the question of the fairness of the rate itself, and the *second* whether or not there has been a change of method which justifies a company in establishing a new rate for a particular job. Let us consider these two typical disputes separately.

(1) *A Claim the Standard is Unfair*

When a claim that the rate is not fair goes to arbitration, it will rarely involve questions concerning the machine cycle time. Such times can be mathematically determined and proved. Such a dispute, therefore, will generally involve the time required to perform the manual elements of the task. When typical stop-watch observations are made, the time recorded to actually perform the manual elements must be leveled to the time that a "normal man" would require to perform such tasks working at either day work ("low task") or incentive ("high task") pace. The dispute will revolve around the fairness or "accuracy" of the normalized manual performance time.

In the typical dispute over leveling of the actual performance time to the "normal" time, the arbitrator usually finds himself in a difficult dilemma. He is being asked to look through the eyes of a time study observer at an employee, whom he never saw, perform a job which can never be performed again at exactly the same pace, and determine whether the relative work pace of that employee as estimated by the observer was correct. His dilemma is increased because no one can tell him what mental "normal pace" the observer used as the standard of comparison. Here is what Walter Reuther says about the inaccuracies of leveling:

> "The ordinary stop watch time study involves use of a 'leveling' or 'rating' factor. This is the time study man's guess. He puts down a percentage figure which is supposed to indicate the degree to which the worker studied was performing faster or slower than some hazy idea of 'normal.' ***"

If a union representative also observed the employee performing the job the dispute does not become easier to resolve. It will then involve the variation between the leveling judgments of the two observers.

Although there are various ways to demonstrate in arbitration the relative accuracy of a leveling judgment, the use of MTM procedures is one of them. As soon as the principles on which MTM is based are explained to the arbitrator, the complete dilemma which would otherwise confront the arbitrator should begin to clear up. When he then is presented with an MTM analysis he is receiving the means of resolving his dilemma.

In arbitration work, the MTM system has a substantial advantage over other predetermined time systems. The MTM program has been buttressed by a great deal of academic research of the highest

quality. For example, Cornell University has published studies and MTM now sponsors research at the University of Michigan. This all adds to the scientific background of the system which permits the arbitrator to accept it as an approved technique.

In spite of the large number of scholars who are members of the MTM Association, there have been critical comments about MTM from academic quarters. Professors Nadler, Mundel, and Davidson have made such comments. Most of these criticisms do not seem to me to be sound. For example, one of them goes like this: Since MTM evaluations were based upon performance times which were leveled, MTM evaluations cannot be more accurate than the original leveled performance times and therefore the inaccuracies of leveling are not overcome by MTM. This circular criticism doesn't prove anything and overlooks MTM's greatest value which is the consistency which results from the elimination of leveling variations.

The effect of this academic criticism is about zero in plants where MTM has produced good results. Let us assume that in a plant it can be shown that MTM standards have in fact produced incentive earnings for qualified employees which have averaged 20% above base rate. When this fact is demonstrated to the arbitrator, it makes no difference from that point on whether the work pace in the particular plant was slightly higher or slightly lower than someone's theoretical concept of a normal incentive pace, or whether the original studies upon which MTM values were based were leveled by judgment or not. The only problem that remains is whether or not the MTM procedures were accurately applied to the job in question. If they were accurately applied, the arbitrator must assume that the employees working on the job will have as "fair a break" as the other employees in the plant who are working on standards based on MTM values.

For these reasons I dispose of the highly academic criticisms that these three professors made but union spokesmen quote and requote these three and, of course, it causes some arbitrators to become confused.

Here again the Association could render a service by having some scholar take up the arguments of these three professors and dispose of them in an orderly manner. Such a study could be rebuttal if in some future hearing the unions get these skeletons out of the closet (by that I mean the early writings of these three professors).

One criticism which can be raised in an arbitration case against MTM is the assertion that when MTM and Work Factor evaluations are converted to the same normal base (to either "high task" or "low task") the variation between the findings do not remain relatively constant when the findings for jobs containing long or abnormally short "reaches" are compared, which system contains the distortion within itself.

I would like to see a very thoughtful study comparing both Work Factor and MTM so I could determine what degree of validity there would be to such a challenge.

Finally, it would be helpful if the Association would publish the MTM data on both a "high task" and "low task" basis. When dealing with the question of the adequacy of an incentive rate, it is always easier to explain to an arbitrator that the agreed upon minimum earnings opportunity has been provided if you can point to an incentive factor in the calculation rather than try to explain the assumption that the "normal man" will exceed the standard by 20 - 25%. Incentive pace has always seemed to me a much more real and provable concept than the pace the abstract normal man works at when he is working on a day work basis.

Incidently, professors of industrial engineering at the various universities can be extremely helpful as expert witnesses in arbitration. Many arbitrators must be educated in techniques such as MTM, and the impartial teacher from the university can be of great help. In this connection, an instruction course especially designed for arbitrators, which could be sent by mail, would be a worthwhile Association project.

### The Possible Judgment Errors In Applying Predetermined Times Can Be Resolved

Of course, an argument could arise concerning the application of predetermined time values to a particular motion or to a series of motions. For example, an argument could arise over the question of whether the task required a piece to be moved to an "exact location" or to an "approximate location."

Let us assume that such a dispute arose. The arbitrator would be presented with the two alternative applications which each side would fully explain. From then on the handling of the dispute would resemble quite closely a dispute involving the slotting of a given type of work into one of two described job classifications. The arbitrator is asked, after examining the work of the job classification, its skills, responsibilities, fatigue factors, etc., and hearing the contentions of the parties, whether it should be classified as the union contends into classification A or remain where the company has classified it in classification B.

There is an established principle in arbitration, reflecting properly the management function, to the effect that if management has the initial right to make a determination, the arbitrator should not substitute his judgment unless he finds that the company's initial judgment was applied in an arbitrary manner. Arbitrator Wardlaw stated this rule as follows:

> "It is not the function of the arbitrator to substitute his judgment for that of the party primarily

having the right to exercise it in the first instance unless there is a clear showing that the action was taken in an arbitrary manner or not in accord with the intent and meaning of the agreement."

Therefore, even if reasonable men could differ about the slotting of a motion into the predetermined time value chart, the determination of the management should not be disturbed under this rule unless it is shown to be arbitrary. Even if the arbitrator did not follow this rule and selected the "slotting" the company thought was wrong, the determination would change the standard only a very small amount. If such changes were all that could be obtained, arbitrations would not be held.

(2) *A Claim that The "Methods" Were Not Changed*

Labor agreements generally say that the management shall not establish a new incentive standard unless there is a change in the method of performing the task. This provision is the result of a desire to assure employees that standards will not be changed merely because, due to high effort, earnings rise. It is hoped that such a commitment will free employees from fear that the standard will be cut and high effort on all jobs will be more typical.

Where you have a change in the feeds and/or speeds of a machine which affect the time cycle required in performing the task, the problem is not particularly difficult to handle. The employee can see the machine go faster and the effect of such changes can easily be calculated.

However, the methods change problem becomes more difficult when the methods change is simply a change in the employee's motion pattern. Let us illustrate this latter problem by two actual examples:

An operator takes a small washer and positions it over a hole on a short length of angle iron; puts one side of the washer under a spot welding machine and trips the machine; *then he takes the part out and turns it around* and places the other side of the washer under the spot welder and trips the machine. As soon as the standard was released, the employee placed the washer on the piece, put the washer under the spot welder and made two spot welds with a *"spot move spot"* motion, then removed the piece and put it in the tote box.

The operator changed from an inefficient motion pattern to an efficient one — only manual motions were changed but the normal time that was required to perform the task was reduced. Therefore, the standard applicable to the more efficient motion pattern or method should be established.

Some unions, some managements, and some arbitrators incorrectly believe that such a change should be considered an employee-invented method change and as such does not justify a change in the standard. Such a concept puts a premium on the presentation of false motions when the task is being analyzed so as to gain an "unfair" advantage. Furthermore, it ignores the basic fact that incentive compensation pays for effort and not ingenuity or skill.

Another example of motion pattern change involved the polishing of a hardware part. The employee took the part, put it against the polishing wheel, gave it a pass, then another pass, then a third. *He then reversed the part in his hands and gave it three similar passes on the other end.* Then he polished the two tips and put the part in the tote box. As soon as that method was recorded and the standard released, the employee changed the method to a five-pass method. He no longer turned the piece around in his hands. Therefore, he was employing a different method which consisted of a different motion pattern.

A time study representative observed the employee using the five-pass method instead of the eight-pass method on which the standard was based. This latter method had been established as the prescribed method. An operational analysis card which set forth a diagram showing the prescribed eight-pass method had been filed in the department and it contained the following statement: "No deviation from the prescribed method unless a new time study is made."

When the change in method was discovered, the parts produced with five passes were examined and found to be satisfactory from a quality standpoint. A new standard was established for the five-pass method, and the new prescribed method was set forth on a new operational analysis card.

A predetermined time motion analysis was made and it established that 58 separate motions were required when the eight-pass method was used, whereas only 37 motions were required with the five-pass method. Therefore, less effort was involved when five passes, rather than eight passes, were made.

A dispute arose and the matter went to arbitration. The predetermined motion analysis was used in the arbitration to prove that a reduction in effort was involved in the change in motion pattern and to demonstrate further that such a change was change in method.

If the arbitrator had not accepted that basic proposition, he would have rendered a decision directly opposed to the very foundation of predetermined time systems. The arbitrator accepted the basic proposition and he stated that the company had the right to specify the method to be used and hence had the right to specify the motion pattern to be followed.

### The Use of Predetermined Times Helps Resolve Other Disputes

There are other values to be derived from the use of predetermined times, which help in the resolution of disputes with unions.

First, there is a renewed effort to describe more accurately the methods employed to perform an incentive task. It is always difficult to handle an

incentive dispute in arbitration if it can't be determined just what task the standard was intended to cover. Inadequate descriptions cause lots of trouble. To use predetermined times, the motion pattern employed must be carefully described.

Second, the use of MTM techniques will increase the effort to find the best motion pattern or method of performing the task. The timing of false or inefficient motion patterns, coupled with inadequate methods description, is, next to leveling disputes, the cause of most of our difficult grievances. MTM corrects both of these causes of dispute.

### Men Are Machines

When MTM is used extensively, some unions exploit the psychological problem inherent in all repetitive work just as Charlie Chaplin did in "City Lights." They claim that such procedures make the working man into a machine; that the last of his individuality is being stripped away when you tell him, "You must move your body just this way when you perform this task." The union spokesmen support their attack with quotations from Chiselli and Brown, "Personnel & Industrial Psychology," U. of California, 1948, and "Work and Effort" by Thomas Ryan.

However, in spite of these arguments, if a management can find a way of reducing the human effort involved in performing a task, the result is socially good. Even the UAW-CIO says this. In the long-term contracts, you will typically find this language:

> "The annual improvement factor provided in this section recognizes a continuing improvement in the standard of living of employees which depends on technological progress, better tools, methods, processes, skills and cooperative attitudes on the part of all parties in such progress. *It further recognizes the principle that to produce more with the same amount of human effort is a sound and social objective* ***." (Emphasis added)

Let me close this discussion with another quotation from Walter Reuther. It points out why he does not like MTM but it also explains why managements believe that in MTM and other predetermined time systems they may have found the answer.

> "Management has never been happy with the necessity to bargain on production standards and piece rates. It has long been looking for a way to end such bargaining by convincing the workers that there is a 'scientific' way to set fair standards and rates. Time study was at first promoted on that basis. Now that experience has made workers increasingly skeptical of standard time study practices, management welcomes Methods-Time-Measurement as a new 'scientific' excuse to eliminate or stifle bargaining.
>
> "Methods-Time-Measurement is particularly attractive to management because, at the very least, it would hopelessly complicate bargaining on individual grievances involving standards or piece rates. A challenge to any individual standard established by this system would, in effect, involve a challenge to the standards for every other job in the plant which includes any of the same basic motions as the job originally in dispute."

This comment of Reuther's is a compliment to MTM. Complete consistency of earnings opportunity, job-to-job throughout the plant, is good industrial relations. Some day the union leaders who want to retain incentive standards within the "guesswork" area, because they are easier to bargain up and loosen, will also agree that predetermined times which eliminate the leveling variation and thereby increases consistency, is a substantial step forward.

# MTM NEWS

The MTM Association is pleased to announce the formation of the MTM Association of Switzerland, a Chapter of the Methods Time Measurement Association for Standards and Research.

The address of the newly formed chapter is:

Executive Secretary
MTM Association of Switzerland
c/o Institut d'Organisation Industrielle à
l'Ecole Polytechnique Fédérale
Zurich, Switzerland

MTM EXHIBIT—A.I.I.E. CONFERENCE

MTM was exhibited at the National Conference of the American Institute of Industrial Engineers, May 11, 12 and 13 in St. Louis, Missouri.

The booth (shown below) was sponsored by the St. Louis Chapter and the National Association. Conference attendees expressed considerable interest in the exhibit, especially with respect to Research Reports on work accomplished by the Association Research Projects.

**EFFECTIVE MAY 1, 1955**

**ORDER BLANK**

| | QUANTITY | UNIT PRICE | | EXTENSIONS |
|---|---|---|---|---|
| RESEARCH REPORTS | | Member | Non-member | |
| R.R. 101 | | .75 | 1.00 | |
| R.R. 102 | | .50 | .75 | |
| R.R. 104 | | .50 | .75 | |
| R.R. 105 | | 2.25 | 2.50 | |
| R.R. 106 | | 2.25 | 2.50 | |
| R.R. 107 | | 2.25 | 2.50 | |
| R.R. 108 | | 2.25 | 2.50 | |
| Application Training Supplement | | 2.00 | 2.25 | |
| Proceedings | | | | |
| 1952 MTM Conference | | 2.00 | 2.00 | |
| 1953 MTM Conference | | 4.00 | 5.00 | |
| 1954 MTM Conference | | 4.00 | 5.00 | |
| Data Cards | | | | |
| Detailed Paper | | | | |
| Detailed Plastic | | | | |
| Condensed (plastic) | | | | |
| Simplified (paper) | | | | |

**NAME** ______________________ PLEASE SEND BILL________

**POSITION**______________ **COMPANY**______________ PAYMENT ENCLOSED________

**ADDRESS** ______________________

Remittance must accompany orders under $5.00.

*Send order to: MTM Association for Standards and Research, 531 East Liberty Street, Ann Arbor, Mich.*

RESEARCH REPORTS

R.R. 101 Disengage

This report contains a preliminary study of the element disengage. While it is still classified as tentative, the report contains some extremely interesting conclusions on the nature and theory of this element.

R.R. 102 Reading Operations

The first step in the use of MTM for establishing reading time standards is contained in this report. In addition, the report contains a synopsis of the work done in this field by 11 leading authorities.

R.R. 104 MTM Analysis of Performance Rating Systems

A talk presented at the SAM-ASME Time and Motion Study Conference, April 1952. It contains an analysis of performance rating systems and various performance Rating Films from an MTM standpoint.

R.R. 105 Simultaneous Motions

This report represents almost two man-years' work on a study of Simultaneous Motions. It is a final report of the Simultaneous Motions project undertaken by the MTM Association. While it does not purport to provide complete and exhaustive answers to all problems in the field of Simultaneous Motions, it presents a great deal of new and valuable information which should be of interest to every MTM practitioner.

R.R. 106 Short Reaches and Moves

This report contains an analysis of the characteristics of Reaches and Moves at very short distances. It develops important conclusions concerning the application of MTM to operations involving these short distance elements.

R.R. 107 A Research Methods Manual

The research activity of the Association has developed an effective and comprehensive set of methods for carrying on research in human motions. This report details the major techniques used. Adequate sources of motion data, film analysis, data recording, and statistical methods of analysis are among the topics discussed.

R.R. 108 A Study of Arm Movements Involving Weight

In this report, the results of a large investigation into the effect of weight on the performance times of arm movements are presented. While more effective means of determining correct time allowances for moving weights are given, the comprehensive discussion of the whole area of weight phenomena is probably of more fundamental importance. The effect of such conditions of performance as the use of one or two hands, sliding vs. spatial movements, and male and female performance are among the topics presented.